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Three new records of *Porina* from China

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Abstract —Three species of the lichen genus *Porina* are newly reported for China: *P. internigrans*, *P. kamerunensis*, and *P. subrubrosphaera*. Taxonomic descriptions, illustrations, and comments are provided.

Key words —*Ascomycota*, *Lecanoromycetes*, *Ostropales*, *Porinaceae*, taxonomy

Introduction

Porina Ach. (*Porinaceae*) is widely distributed in the tropics and subtropics, and some species also occur in temperate regions. Most species are epiphytic on bark and leaves in shaded and humid environments, while a substantial minority are saxicolous (McCarthy 2000, 2003, 2013; Lücking & al. 2001; Lücking 2008). The genus is characterized by its crustose thallus, perithecioid ascomata, unbranched paraphyses, functionally unitunicate apically thin-walled clavate-cylindrical asci, and transversely septate to muriform hyaline ascospores with thin walls and septa.

Porinaceae includes nearly 400 species (McCarthy 2003, 2013; Lücking 2008; Lücking & al. 2017; Sobreira & al. 2018). The generic concepts in the family are much in flux and a final consensus has not yet been reached. Some authors maintain a more conservative classification, mostly considering *Porina* and *Trichothelium* Müll. Arg. as the main genera (McCarthy 2003, 2013; Lücking 2008). However, most prefer to divide the family into smaller genera, primarily because of the large number of species in *Porina* (Hafellner & Kalb 1995, Harris 1995, McCarthy 1995, McCarthy & Elix 1996, McCarthy & Malcolm 1997, Lücking & al. 2017, Sobreira & al. 2018).

Porina includes more than 300 species worldwide according to McCarthy (2013), and 45 taxa are known from China (Wei 1991, Aptroot & Seaward 1999, Aptroot & Sipman 2001, Aptroot 2003, Aptroot & al. 2003, Liu & Wei 2013, Liu & Zhao 2019). Here, we present new Chinese records of three *Porina* species based on our study of specimens recently collected in southern China.

Materials & methods

The specimens are deposited in the Herbarium Mycologicum Academiae Sinicae – Lichenes, Beijing, China (HMAS-L) and the Fungarium of the College of Life Sciences, Liaocheng University, Liaocheng, China (LCUF). Morphological characters were examined and photographed using Olympus SZX16 dissecting microscopes. Anatomical characters were studied and photographically documented using an Olympus BX53 compound microscope. Thalli were tested using K (a 10% aqueous solution of potassium hydroxide). Lichen substances were analyzed using standardized thin layer chromatography (TLC) (Orange & al. 2010, Jia & Wei 2016).

Taxonomy

Porina internigrans (Nyl.) Müll. Arg.,
Rep. Australas. Assoc. Advancem. Sci. 6: 452 (1895) Fig. 1a–c

Thallus crustose, epiperidermal, continuous to sparingly rimose, somewhat glossy, yellowish green to yellowish brown, incrusted with calcium oxalate crystals. Prothallus dark brown or absent. Photobiont a species of *Trentepohlia*, cells angular-rounded, irregularly arranged, 5–8.5 × 5–6.5 µm. Perithecia numerous, immersed in thallus-dominated verrucae; verrucae 0.5–0.9 mm diam., hemispherical with lightly spreading base, usually solitary, concolorous with the thallus usually for the most part, with broad black spot around ostiole, 0.1–0.3 mm wide, in a shallow depression or flattened at apices, with inconspicuous ostioles. Involucrellum apical to dimidiate, reddish brown, extending to the middle of the exciple, K+ orange-red, 16–50 µm thick. Exciple 15–40 µm thick, yellowish brown, K+ pale orange-red. Centrum 400–420 µm wide. Asci cylindrical, 210–218 × 32–37 µm. Ascospores broadly fusiform, (11–)13(–17)-septate, 89–116 × 12–18 µm; perispore apparent, 2–4 µm thick. Pycnidia not seen.

Chemistry: Thallus UV–, K+ brown. No lichen substances detected with TLC.

Specimens examined: **China. Guizhou Province, Duyun City**, Doupeng Mountain Reserve, Old Post Road, alt. 1154 m, on bark, 17/III/2018, X.H. Wu (LCUF

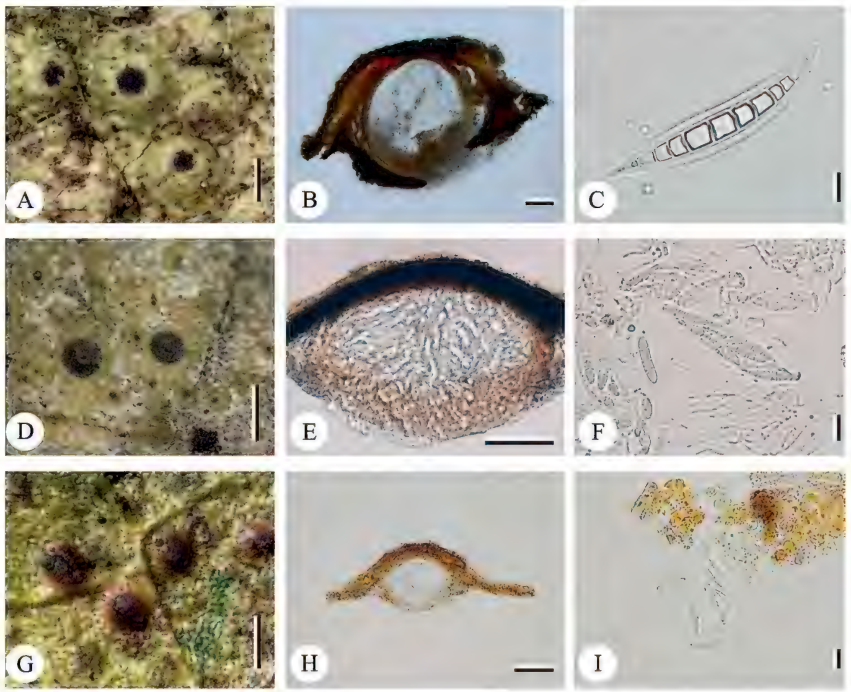

Fig. 1. ***Porina internigrans*** (LCUF, Wu GZ18144). A. Thallus with perithecia; B. Cross section of perithecium in water; C. Ascospore. ***Porina kamerunensis*** (HMAS-L 119188-3). D. Thallus with perithecia; E. Cross section of perithecium in water; F. Ascus and ascospores. ***Porina subrubrosphaera*** (HMAS-L 20190443). G. Thallus with perithecia; H. Cross section of perithecium in water; I. Asci and ascospores. Scale bars: A, D = 0.5 mm; B = 100 um; C, F, I = 10 µm; E, H = 50 um; G = 0.2 mm.

– Wu GZ18144). **Guangdong Province**, **Shixing County**, Chebaling National Nature Reserve, Sanjiaotang, alt. 420 m, on bark, 19/III/2019, S.H. Jiang, C. Zhang (HMAS-L 20190651).

Ecology & distribution: On tree bark. Southwestern and southern China. Palaeotropical (McCarthy 2001) and neotropical (McCarthy 2013).

Remarks: Morphologically, *Porina internigrans* resembles *P. bellendenica* Müll. Arg., which differs in having smaller asci, smaller ascospores, and a thin perispore. The ascospores of our specimens tend to be larger than Australian material of *P. internigrans* (51–92 × 9–17 µm; McCarthy 1994, 2001), but almost identical to the size range of Japanese collections (62–116 × 7–15 µm; Harada 2016).

Porina kamerunensis F. Schill., Hedwigia 67: 289 (1927) FIG. 1D–F

THALLUS crustose, foliicolous, dispersed into radial and roundish patches, smooth and slightly glossy, yellowish green to yellowish brown. PROTHALLUS silvery white or absent. PHOTOBIONT cells rectangular, forming radiating plates, 7–8.5 × 2.6–3.2 µm. PERITHECIA superficial, lens-shaped, base spreading, the centre conical, dark greyish black to black, slightly glossy, 0.25–0.5 mm diam.; apex a black cap; ostiole inconspicuous. INVOLUCRELLUM black to violet-black in thin section, K–, 28–38 µm thick. EXCIPLE 10–20 µm thick, yellowish brown, K–. CENTRUM c. 150 µm. ASCI cylindrical to obclavate, 53–66 × 11.7–14 µm. ASCOSPORES elliptical to bacilliform, 3-septate, 17–23 × 3.7–4.6 µm; perispore not apparent. PYCNIDIA not seen.

CHEMISTRY: Thallus UV–, K+ pale yellow brown. No lichen substances detected with TLC.

SPECIMENS EXAMINED: **CHINA. HAINAN PROVINCE, Ledong City**, Jianfengling, alt. 150 m, on leaf, 21/V/2007, Q.F. Meng M283 (HMAS-L 119188-3); Mt. Bawangling, alt. 820 m, on leaf, 31/VII/2009, Z.F. Jia (HMAS-L 119189).

ECOLOGY & DISTRIBUTION: On leaves. Southern China. Pantropical (Lücking 2008).

REMARKS: Morphologically, this species resembles *P. chrysophora* (Stirt.) R. Sant., which differs in the central part of the perithecia being lens-shaped and the photobiont cells irregularly arranged. It is also similar to *P. oxneri* R. Sant., which differs in its smaller perithecia (0.15–0.25 mm) without a spreading base and its greyish black, matte thallus (Lücking 2004). The ascospores of our specimens tend to be larger than material from Mexico and Costa Rica (14–20 × 2.5–4 µm; Lücking 2008), but almost identical to Australian collections (15–24 × 3–4.5 µm; McCarthy 2001).

Porina subrubrosphaera Kurok., J. Jap. Bot. 33: 206 (1958) FIG. 1G–I

THALLUS crustose, foliicolous, continuous, smooth and slightly glossy, pale greyish green. PROTHALLUS absent. PHOTOBIONT cells angular-rounded, irregularly arranged, 4–9 × 2.5–5.5 µm. PERITHECIA superficial, lens-shaped to wart-shaped or hemispherical with a slightly spreading base, 0.1–0.2 mm diam., dark red-brown; apex a dark red; ostiole inconspicuous. INVOLUCRELLUM apical to dimidiate, red-brown, extending to the base of the exciple, K+ orange-red, 10–25 µm thick. EXCIPLE 5–11 µm thick, yellowish brown, K+ pale orange-red. CENTRUM 77–84 µm wide. ASCI obclavate, 41–58 × 7–9.8 µm. ASCOSPORES oblong, 3-septate, 13–18.6 × 2.5–3.4 µm, 4.6–6.6 times as long as broad; perispore inconspicuous. PYCNIDIA not seen.

Chemistry: Thallus UV–, K+ brown. No lichen substances detected with TLC.

Specimens examined: **CHINA. Fujian Province, Wuyishan City**, Shibazhai Scenic Area, alt. 500 m, on leaf, 16/III/2019, W.C Wang (HMAS-L 20190436; HMAS-L 20190443); Longchuan Grand Canyon, alt. 400 m, on leaf, 16/III/2019, W.C Wang (HMAS-L 20190411; HMAS-L 20190419).

Ecology & distribution: On leaves. Southern China. Japan, Thailand (McCarthy 2013).

Remarks: This species is characterized by its greenish thallus with non-radiating photobiont, dark red-brown perithecia, and its oblong and 3-septate ascospores. It is closely related to *Porina limbulata* (Kremp.) Vain., which has a yellowish thallus with radiating photobiont cells, larger perithecia (0.2–0.4 mm diam.), and larger ascospores (21–27 × 3–5 μm; Lücking 1996, 2008). Another similar species, *P. rubentior* (Stirt.) Müll. Arg., has lens-shaped perithecia that are glossy or slightly translucent, while photobiont cells are rectangular, in radiating plates (Lücking 2008). *Porina subrubrosphaera* is also similar to *P. leptospermoides* Müll. Arg., which has lens-shaped to applanately conical with spreading base and blackish red perithecia (Lücking 1996, 2008). The ascospores of our specimens are similar to the size range of Japanese materials (17–18 × 3 μm), which differ by having a broader centrum (100–150 μm) and larger asci (55–75 μm; Kurokawa 1958; Thor & al. 2000).

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